PAPUA NEW GUINEA PROJECT NOTE 11 AUGUST 2022

Synopsis: Improving agricultural value chain coordination and gender inclusiveness in Papua New Guinea

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Key Policy Messages

- Policies and programming to increase efficiency and support infrastructure in the midstream segment (e.g., packaging, processing, and handling) of key value chains—including sweet potato and fresh vegetables—is needed to incentivize farmers to invest in higher yielding crop technology and inputs.
- For the poultry value chain, investments in upstream value chain function and geographic reach are necessary, including expanding branch locations of poultry feed and day-old-chick supply.
- Farmer associations, that are locally designed to ensure sustainability, have been important mechanisms for strengthening value chain coordination in other low- and middle-income countries (LMICs). PNG could invest in feasibility studies to better understand strategic sectors and entry-points for strengthening farmer association and cluster development.
- Women may refrain from participating in higher value chain nodes due to a variety of societal barriers. Programs, targeted at both women and men, to communicate the household benefits of women's off-farm work and household decision-making may be one promising avenue to support improved household wellbeing and economic growth.
- In our study, analysis suggests that when women are working, particularly in entrepreneurial roles, they enjoy a greater say in household decision-making and their households are better off.

Overview

Maximizing efficiency throughout the entire agri-food value chain is critical to fostering greater economic growth and poverty reduction in Papua New Guinea (PNG). Investments in midstream value chain infrastructure (e.g., improved storage facilities, rural feeder roads, electricity, and cold storage transport) are crucial to strengthen linkages between producers and consumers. These investments should also promote *inclusive* development that benefits both men and women value chain actors. In this study, we analyzed three key value chains in Papua New Guinea—poultry, sweet potato, and fresh vegetables—aiming to guide policymakers and stakeholders toward ways to improve productivity, increase revenue, and bolster competitiveness and inclusiveness within the agriculture and livestock sectors.

Domestic demand for poultry in PNG is unmet by current domestic poultry supply. Primary constraints to increasing domestic supply are high input costs (particularly of day-old-chicks (DOC) and feed), and lack of credit and reliable energy supply. In contrast, the sweet potato and fresh vegetable value chains face constraints in their midstream nodes, where poorly coordinated supply, aggregation, transport, and packaging result in higher marketing costs, lower product quality, and less specialization.

Women are heavily involved in all three value chains, but more so in production and sales than in midstream nodes. Using data from the 2018 Papua New Guinea Rural Household Survey on Food Systems (RSFS), we find that women's participation in off-farm work activities is associated with greater participation of women in household decision-making and improvements in household welfare. The results provide a strong business case for policies and programming supporting wider opportunities for women's participation in key agri-food value chains and for their broader involvement in household decision making.

Overview of poultry, sweet potato, and fresh vegetables value chains

Given the importance of sweet potato production for domestic food security; the opportunity of domestic poultry production for increasing protein consumption and decreasing import dependence; and the prospect of fresh vegetables to move beyond domestic marketing to wider export markets, we evaluate each of these value chains, in turn, to identify bottlenecks and opportunities to improving value chain coordination.

Poultry value chain

One reason for the rapid increase of poultry meat imports over the last several decades is the comparatively high price of domestically produced poultry meat in PNG relative to the other countries such as Indonesia. For example, the 2019 retail price in PNG was about $8 per chicken or 4.2 $/kg for live weight, while the retail price of live chicken in Indonesia was 1.5 $/kg, or about one-third the price in PNG (USAID, 2013; Mehta and Galgal, 2019). This suggests there is an opportunity to improve efficiency of domestic poultry production, processing, and marketing to reduce unit costs to both rural and urban populations.

Given the lack of poultry input markets in rural and small-town areas throughout PNG, the entire poultry value chain (outside of the vertically integrated commercial enterprises in the city of Lae) is likely to remain trapped in a low-level equilibrium characterized by low productivity, no growth, and limited job creation. Currently, there is no incentive for new investors to go into areas with limited infrastructure only to face overwhelming costs associated with first entrants.

To increase the economic viability of poultry production outside of Lae, local governments and the poultry industry can support expansion of poultry clusters in other economic centers. These clusters could be developed in tandem with ongoing operations proposed by Zenag and Tablebirds to build livestock input

branches in several highland areas. Another operator, Innovative Agro Industries, has developed branch operations in Western, Hela and East Sepik provinces. Feasibility studies to learn from these private sector branches may inform further rural livestock input operations that face similar first entrant challenges.

While commercialized poultry production must focus on profit maximizing operations, rural poultry cluster development should include food and nutrition security objectives given the current low levels of protein consumption throughout the country. NARI, in collaboration with ACIAR, has developed a mini feed mill model that uses local ingredients such as sweet potato and cassava to produce livestock feed (however mini-mills still require imported concentrates to produce equivalent nutrient content of feed). Assuming success, these mini feed mills could reduce feed costs, improve returns for farmers, and create diversified job opportunities for rural farmers. Such an initiative to reduce input costs should be paired with robust studies to understand economic viability for increasing domestic feed production via a mini-mill development model.

Sweet potato value chain

The limited local retailing of sweet potato is thwarting efforts to increase output, improve quality and enhance value chain efficiency. PNG is not unique to these challenges. Zhang and Hu (2014) demonstrated a detailed example of how the local government and a local potato trade association in Anding county (China) was created to support member farmers with extension, inputs, enhanced communication, and real-time price information to foster trust among value chain actors and promote greater value chain integration. Anding county is now one of the largest potato producing areas in China.

Improving linkages between urban sweet potato demand and rural production supply via investing in midstream value chain nodes and infrastructure is crucial to incentivizing producers to adopt higher quality and greater yielding sweet potato varieties. Recent success in establishing sweet potato clean-seed systems in a variety of countries has significantly improved quality and quantity output while opening other market opportunities (Dennien et al. 2013). The opportunities to expand quality and reliability of sweet potato supply are available in PNG, and it should be evaluated whether some of the areas identified for clean-seed sweet potato (developed in PNG by ACIAR and NARI) production could serve as initial nuclei to form a sweet potato cluster (with association support) to improve rural-urban linkages.

Fresh vegetables value chain

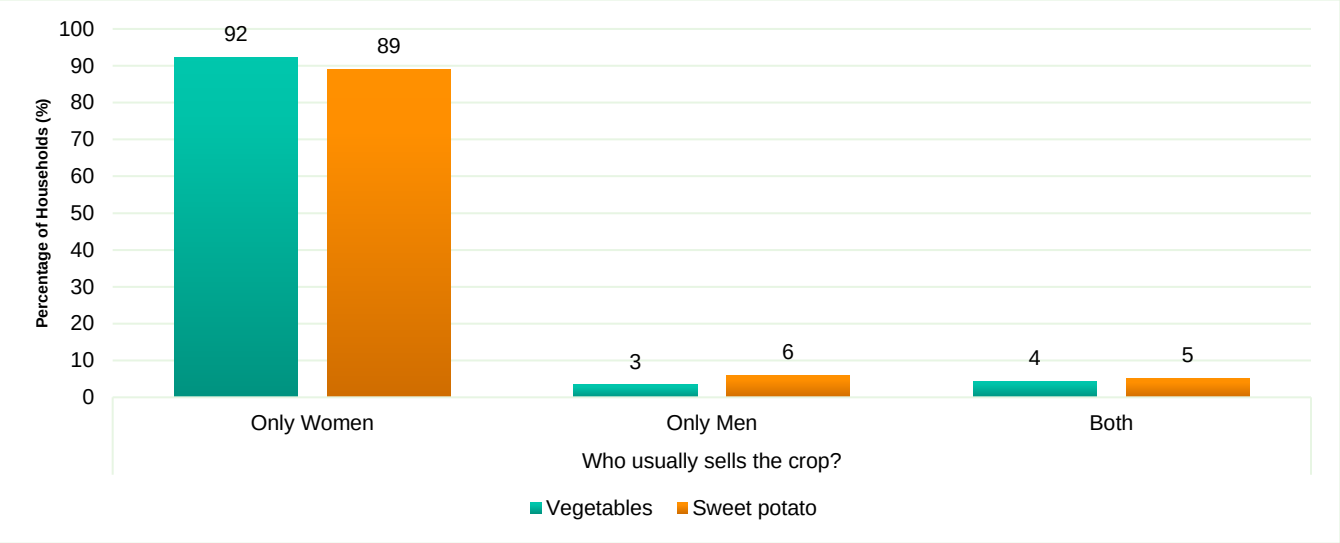
A first step in fostering competitiveness in the export market will be to improve efficiency in the domestic market. This will require decreasing costs of production, while also improving crop output, quality and traceability. Similar to the sweet potato value chain analysis, a fresh produce association that benefits from local government support may be necessary to incentivize PNG smallholder farmers to invest in quantity- and quality-enhancing production practices and technologies.

In addition to supporting a fresh produce association, strengthening fresh vegetable clusters within high-producing areas could reduce investment costs of production, packaging, transportation, and marketing as every node would benefit from geographic proximity. Product clusters also facilitate farmer interaction and learning, as well as provide opportunities to share inputs and services (e.g., irrigation, rural feeder roads, and transport logistics) for greater production and more efficient aggregation and wholesaling. Previous research has also shown that geographic cluster development often increases trust among value chain actors, which can extend to accessing financial credit systems as well (Long and Zhang, 2011).

Women's involvement in the poultry, sweet potato, and fresh vegetables value chains

In PNG, women are heavily involved in agricultural activities, but more so in production and sales than in mid-stream nodes—often due to barriers related to their mobility, access to market information, access to technology and services, and education and skills. Figure 1 presents information about women's participation in sweet potato and vegetables sales.[1,2] Women are the only vendors of sweet potato in 89 percent of households. Women also dominate sales of vegetables. However, previous studies have shown that women face challenges and safety risks with transport and price negotiation (for services) and have less authority than men over how income generated from agricultural sales is used for household purchases (Benediktsson 1998; Spriggs and Chambers 2007).

Figure 1: Share of households by participation of individual's gender



Source: RSFS (2018).

Women's Economic Participation and Household Welfare

Using the 2018 Papua New Guinea Household Survey on Food Systems (RSFS), we investigate how women's off-farm employment participation is associated with household dietary diversity and asset wealth (specifically, production and durable assets).[3] Figure 2 presents OLS regression results graphically.[4] When a horizontal line does not intersect the dashed vertical line at zero, non-farm enterprise (NFE) ownership is associated with a statistically significant increase in the household welfare measure. The further to the right the dot, the greater the effect size. Results suggest that households with sole

[1] Vegetables include green beans, carrots, cucumbers, tomato, onion, garlic, squash, and leafy greens such as pumpkin tips, aibika, tulip, choko, kangkong, cabbage.

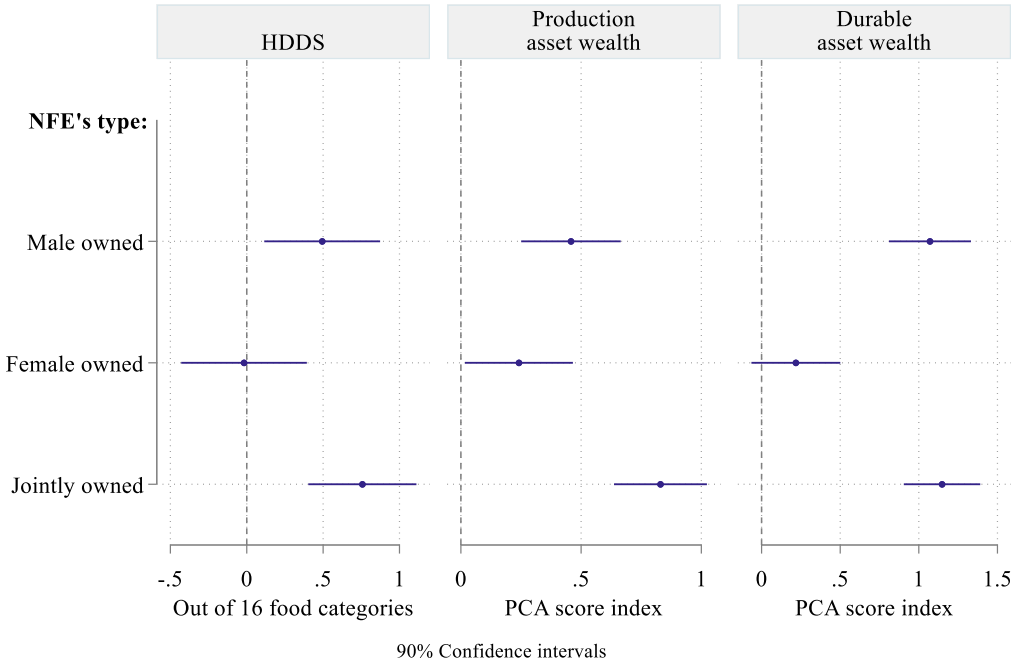
[2] Due to the lack of data on poultry sales in the RSFS (2018), These are omitted from Figure 1.

[3] More details about the methodology, outcome variables and control variables can be found in Kosec et al. (2022).

[4] Dots on the graph represent point estimates while horizontal lines depict 90 percent confidence intervals

women-owned NFEs are associated with higher household production asset wealth. However, a household with a jointly-owned NFE (by women and men) are associated with higher values of all three welfare outcomes. Further, estimates of the benefits of a jointly-owned NFE are in all cases greater than the benefits of a NFE owned only by men. Overall, the results suggest household welfare gains from joint ownership of NFEs and benefits of policy and programming promoting this type of economic involvement of women.

Figure 2: Women's NFE's ownership and household welfare

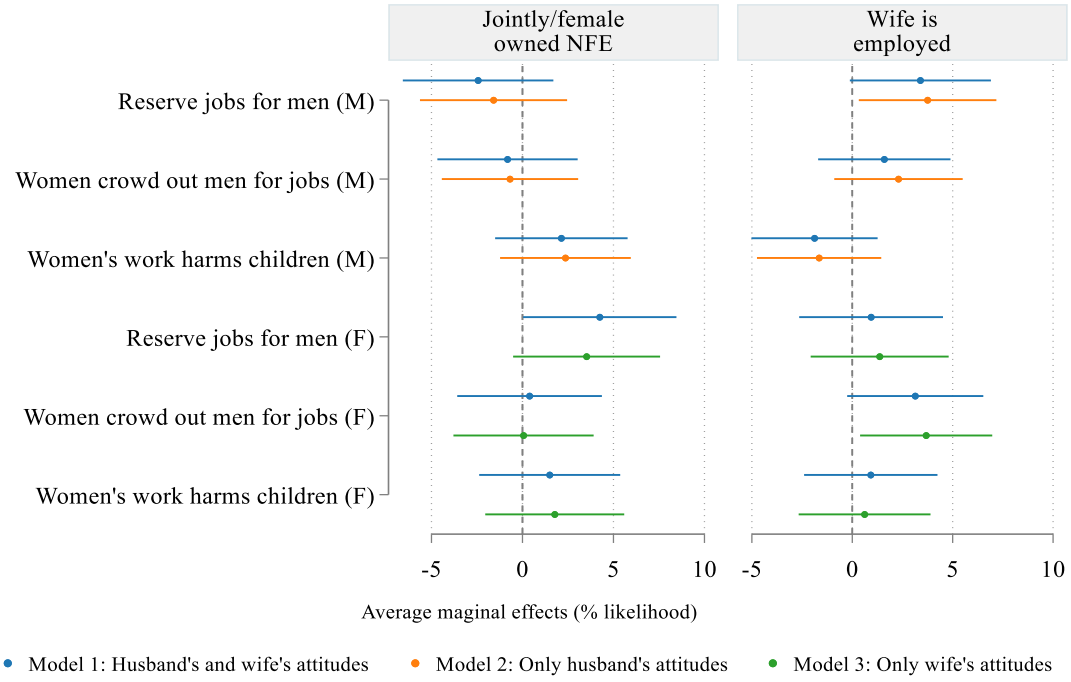


Source: RSFS (2018).
Notes: (1) For this analysis we used full set of controls as described in Kosec et al. (2022). (2) The sample for analysis includes all households.

Gender attitudes and Women's Economic Participation

Given greater gains experienced by households with jointly owned NFEs, we further investigate why women may not be engaging more fully in key nodes of these value chains. We explore whether a set of data on gender attitudes of husbands and of wives are associated with women's economic participation. Results suggest some evidence that women are more likely to be employed if their husband supports greater egalitarian labor participation (Figure 3). However, men's gender attitudes do not significantly influence the likelihood that their household has a jointly owned NFE. For women, in contrast, those that do not agree that jobs should be reserved for men were significantly more likely to be part of a household with a jointly owned NFE. That is, when women feel increasingly like they deserve jobs, they are more entrepreneurial. We also examined whether attitudes toward how women working *affects others*. Men's attitudes appear not to matter in this regard. However, for women, the belief that their working does *not* crowd men out for jobs is associated with greater women's employment.

Figure 3: Women's economic participation and gender attitudes



Source: RSFS (2018).
Notes: The left section includes household-level data, while the right section provides individual-level data from wives.

Overall, our analysis suggests that both women's and men's gender attitudes have some predictive power for women's economic participation. In this regard, programs and interventions that communicate the benefit of women's off-farm employment, targeted at both women and men, may be one promising avenue for increasing women's economic participation.

Conclusion

PNG has a variety of investment options to improve efficiency throughout the entire agri-food value chain. While support to increase agricultural productivity is needed, investments and capacity strengthening in mid-stream value chain operations (such as product aggregation, transport logistics, packaging and processing, and handling) will be important to promote product quality and ensure reliable agricultural and livestock output. Mid-stream value chain investments will be particularly important for the fresh vegetables value chains in order to reach consumer quality demand and export competitiveness.

For the poultry value chain, investments in upstream value chain function and geographic reach are necessary, including expanding branch locations of poultry feed and day-old-chick supply. In addition, agricultural extension focused on improving handling, healthcare, processing, packaging, and transport of chicken will be necessary to meet urban demand for live and processed poultry products.

Our analysis also underscores the need for policies and programming that can boost support for women taking on higher-value, off-farm roles within the value chain. Ensuring that women have meaningful influence over household decision making, which may also relate to greater women's economic participation, is crucial to improving overall household welfare. So too is ensuring that women have access to the information and skills that allow them to make optimal use of these opportunities.

Both women's and men's gender attitudes have some predictive power for women's economic participation. Promoting inclusive economic growth will require community agricultural extension, household capacity strengthening, and intra-household behavior change modifications to successfully incorporate women into more value-added roles along the value chain.

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Kosec, K., E. Schmidt, L. Carrillo, P. Fang, M. Ivekolia, and R. Ovah. 2022. Improving agricultural value chain coordination and gender inclusiveness in PNG. Papua New Guinea Food Policy Strengthening Project Working Paper 4. Washington, DC: International Food Policy Research Institute (IFPRI)

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ACKNOWLEDGMENTS

We benefitted from discussions with Dr. Birte Nass-Komolong, Dr. Michael Dom, Dr. Laurie Fooks, and Janet Pandi at the National Agricultural Research Institute. We also thank Paul Dorosh, Allan Tobalbal Oliver, Ranjitha Puskur, and Xiaobo Zhang who provided feedback on study design and earlier versions of this manuscript.

Funding for this work was provided by the Australia Department of Foreign Affairs and Trade (DFAT) through the Australia High Commission (AHC) in Port Moresby, the CGIAR GENDER Platform (supported by CGIAR Trust Fund contributors (www.cgiar.org/funders)), and the Regional Strategic Analysis and Knowledge Support System for Asia (ReSAKSS-Asia) funded by United States Agency for International Development (USAID). This publication has been prepared as an output of the Papua New Guinea Food Policy Strengthening Project and has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and are not necessarily representative of or endorsed by IFPRI.

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